Wireless Sensor Networks

Prakhar Banga
prakban@iitk.ac.in

Vineet Hingorani
viner@iitk.ac.in

Prof. Sumit Ganguly
sganguly@iitk.ac.in

Dept. of CSE, I.I.T. Kanpur

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Sensors

Sensors

- A device with sensing capability:

Sensors

- A device with sensing capability:
  - Thermometer

Sensors

- A device with sensing capability:
  - Thermometer(Temperature)

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  - Wirless module

Wireless Sensor Networks

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- Consist of sensor nodes and gateway nodes

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  - ...and various others

Wireless Sensor Networks

Differences with ad-hoc networks

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- Addressing issues

Wireless Sensor Networks

Deployment And Maintanence

Wireless Sensor Networks

Deployment And Maintanence

Current state-of-art:

Wireless Sensor Networks

Deployment And Maintanence

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Wireless Sensor Networks

Deployment And Maintanence

Current state-of-art:

- System development from scratch
- Nodes are programmed individually
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- Small changes done manually:
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  - Reprogramming of nodes

Problem Statement

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Designing a general framework:

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- Analogous to systemization of database(1970s)

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Hardware constraints:

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- Costs involved

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  - Personal area vs. Wide area

Related Work

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- Use of TinyOS is prevalent

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- Virtual machine code as programs

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- No capability to map virtual code to binary
- Speed of networking suffers

Various Issues

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- Programming Paradigm

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  - Programming Interface

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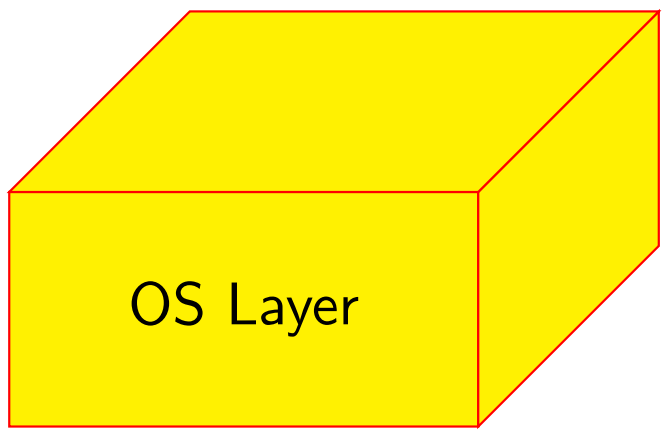
- Networking
  - Scheduling
  - Addressing
- OS
  - Very lightweight
  - Modular for required changes
  - Layered model

Proposed Architecture

Stack Model

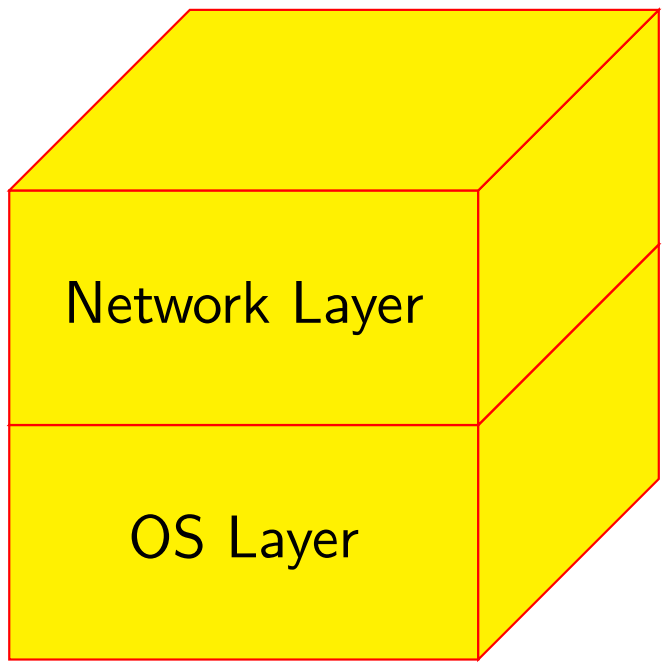
Proposed Architecture

Stack Model



Proposed Architecture

Stack Model



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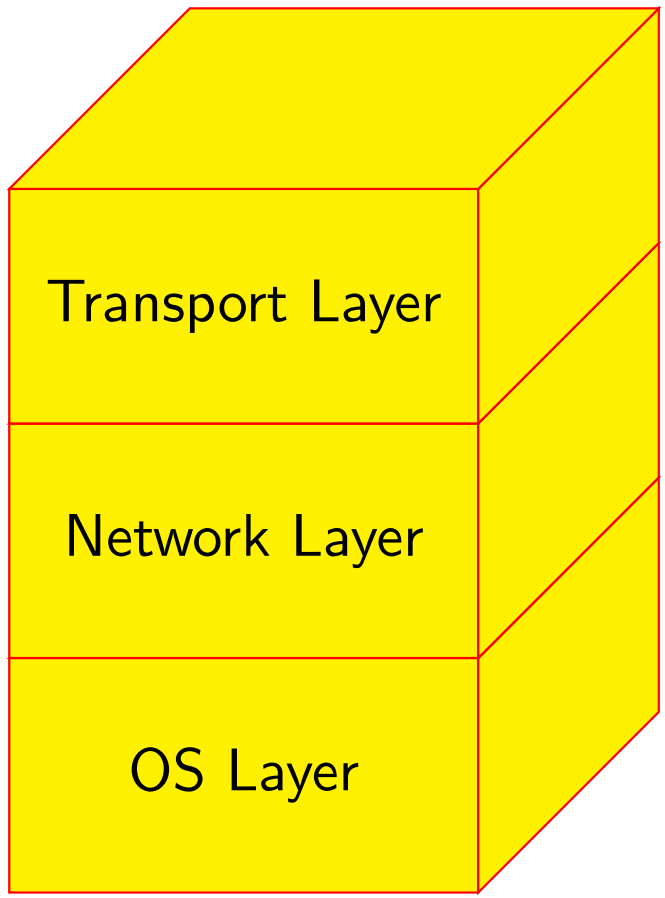

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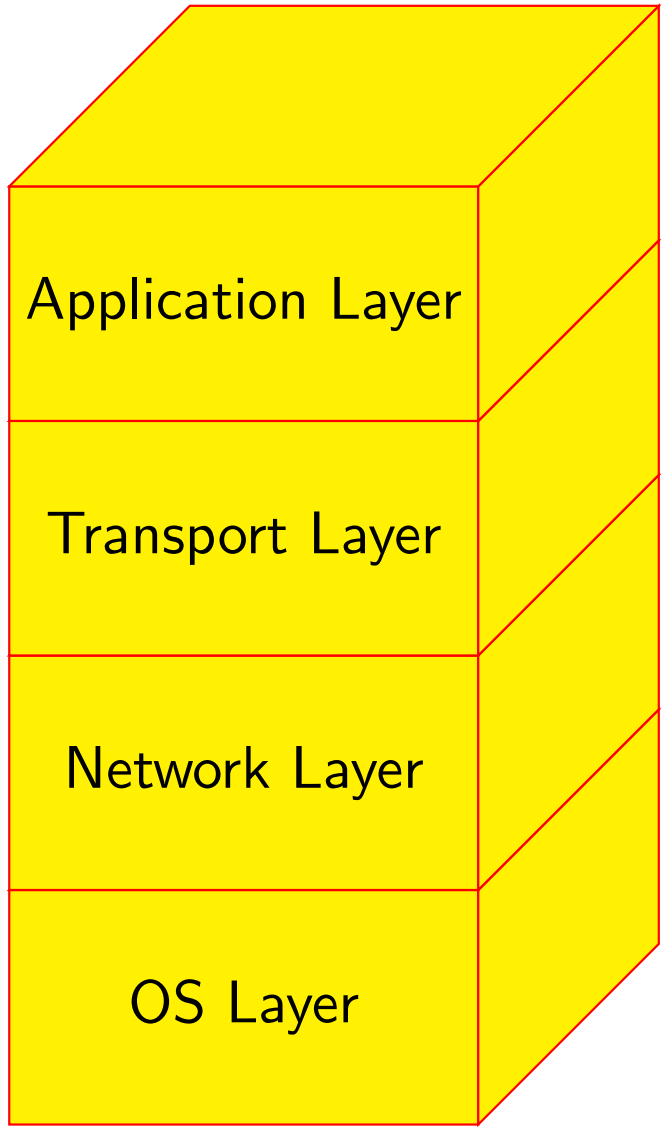

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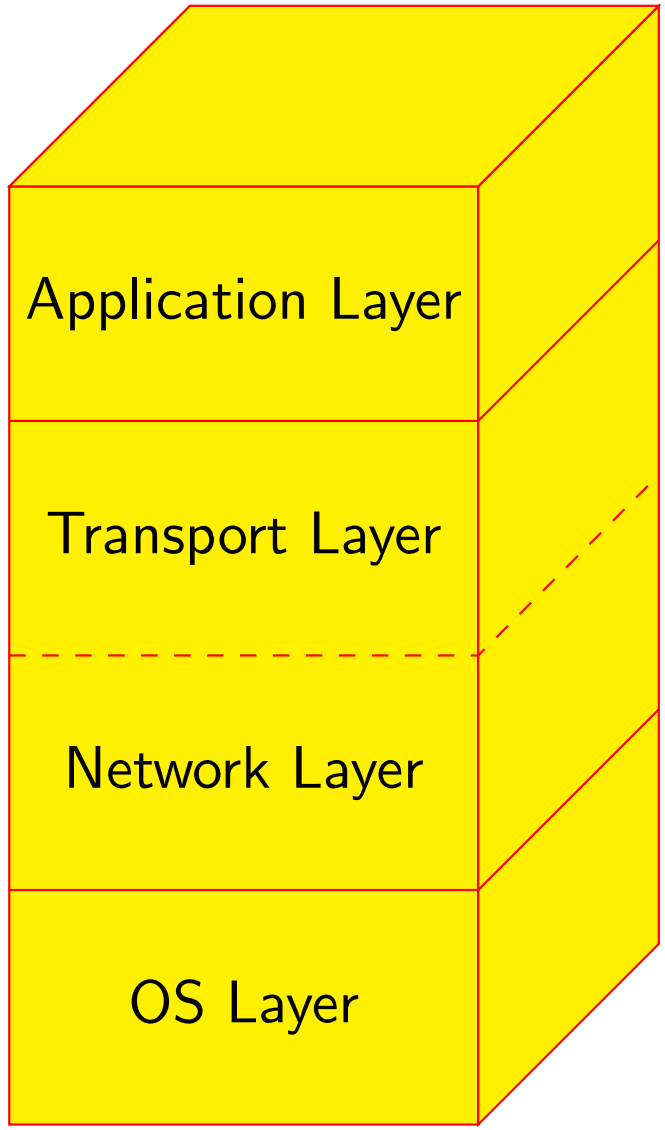

Proposed Architecture

Hierachical Control System

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- n layers of nodes

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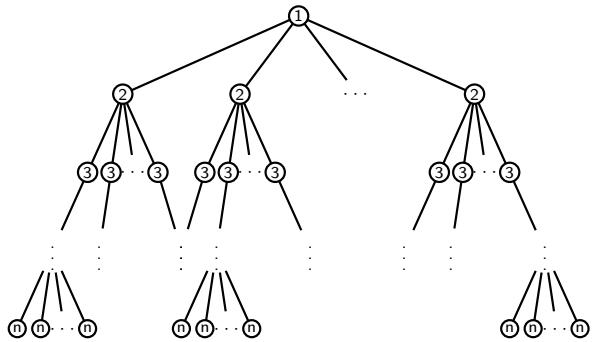

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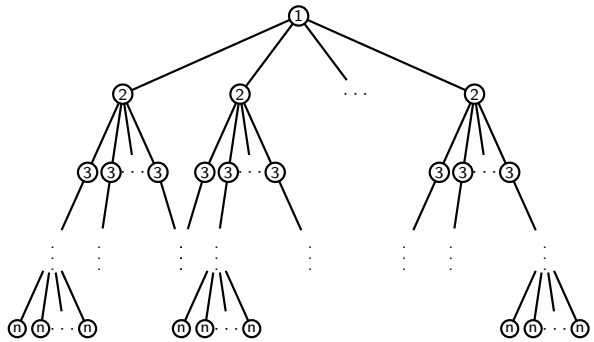

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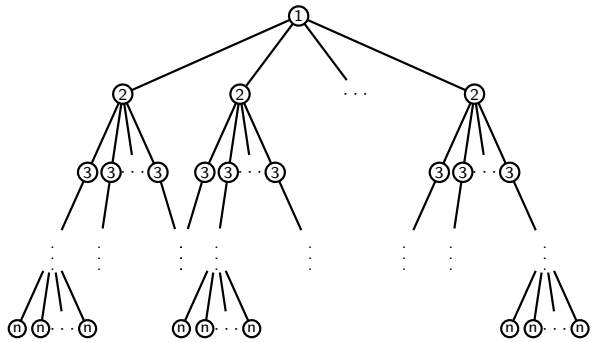

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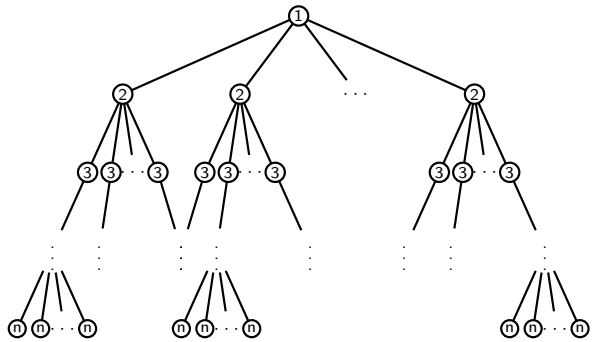

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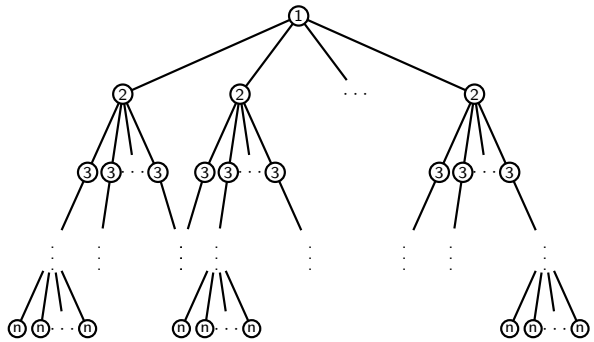

- Higher layers have greater capabilities than lower nodes
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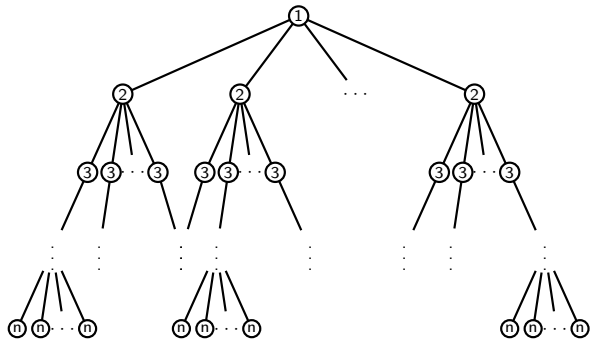

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- Each node(except the lowest layer):
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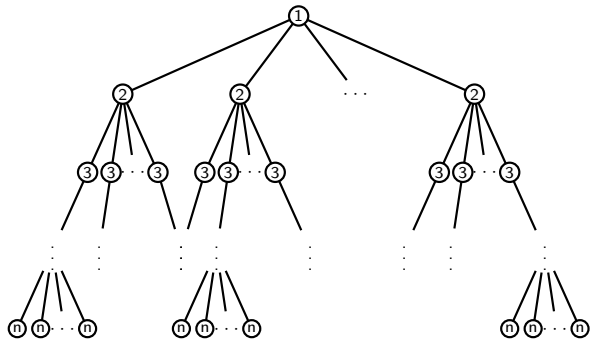

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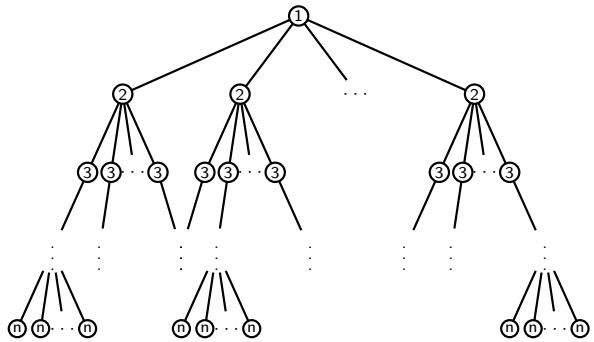

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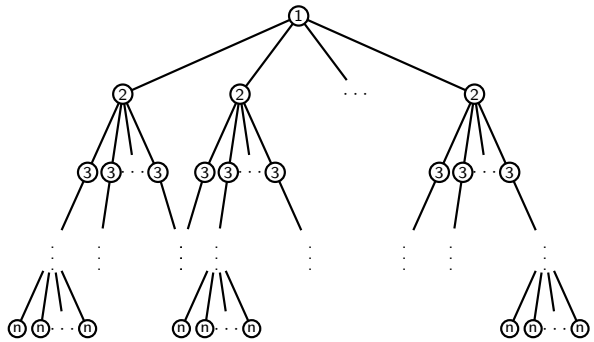

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- The tasks are:
  - Programs in an query-based language
  - Aimed at data filtering/aggregation

Proposed Architecture

Addressing

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A2	V2
A3	V3
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- Examples:

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Lab	1
Row	5

Smart Building

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Smart Building

Attribute	Value
Animal	Lion
Location	Pond Area
Age of Animal	4

Animal Monitoring

Proposed Architecture

Mobility

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Departed Jaipur

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Attribute	Value
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Area	Bunker-4
Condition	Healthy

Fighting Soldier

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Attribute	Value
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Area	Fence-8
Condition	Critical

Soldier Shot

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Query-Based System

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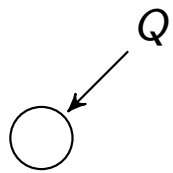

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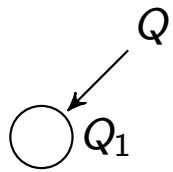

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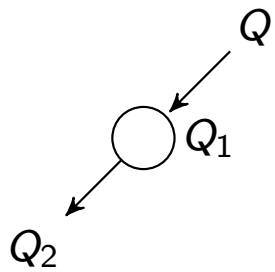

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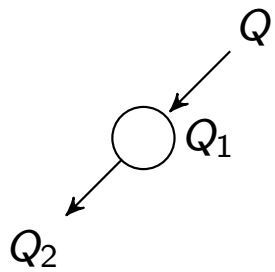

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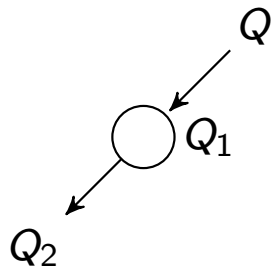

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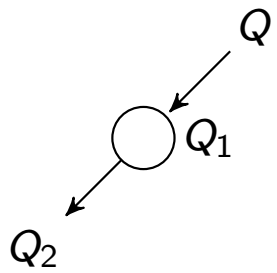

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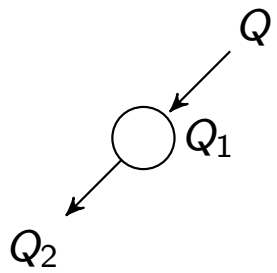

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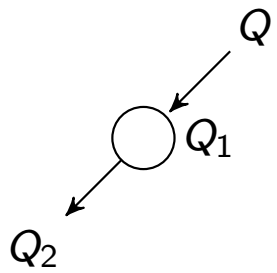

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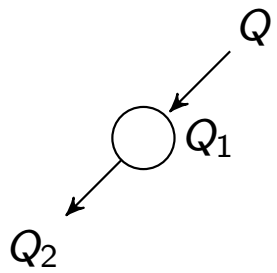

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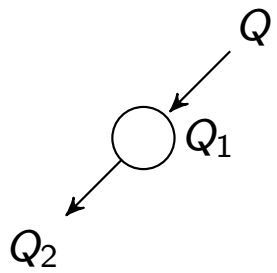

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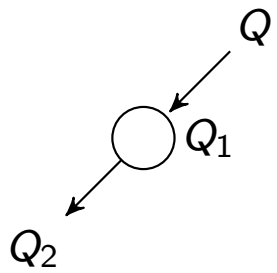

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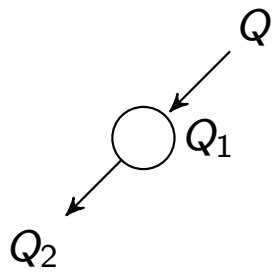

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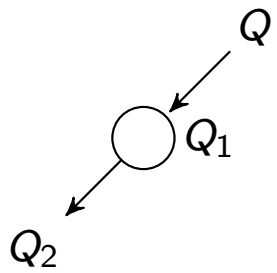

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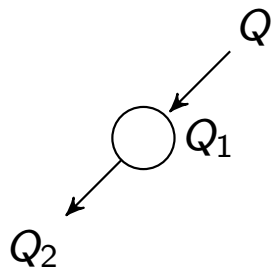

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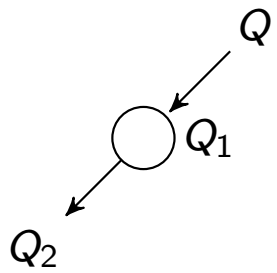

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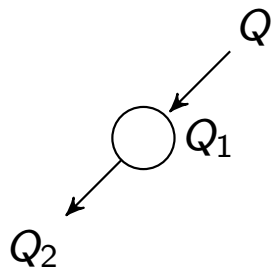

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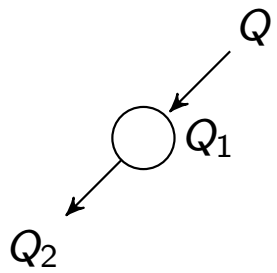

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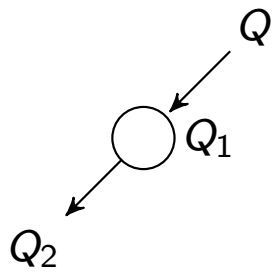

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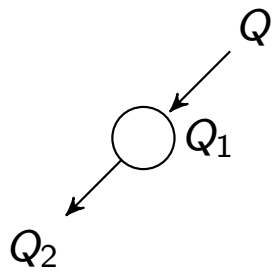

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- Novel concept of query composition with data aggregation

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Emergence: Complex systems arising out of a lot of simple interactions

Transport Layer

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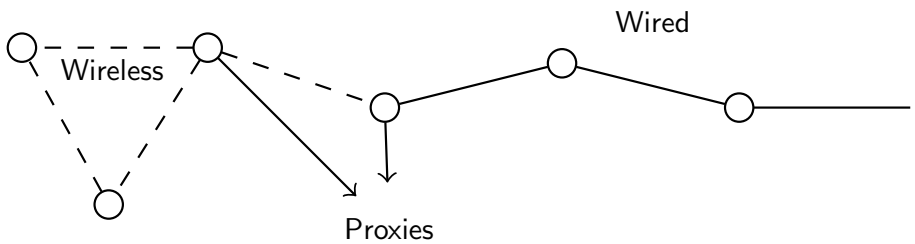

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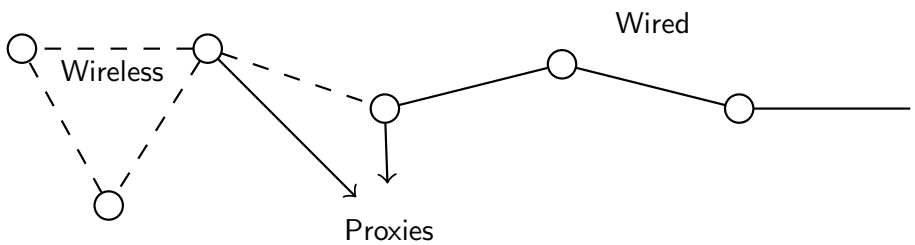

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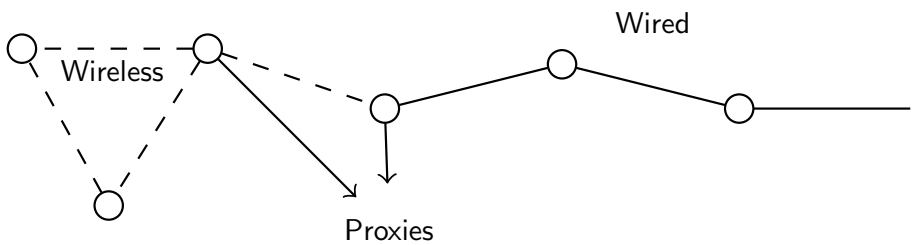

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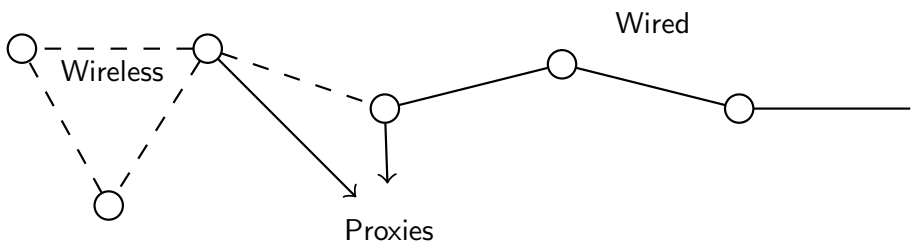

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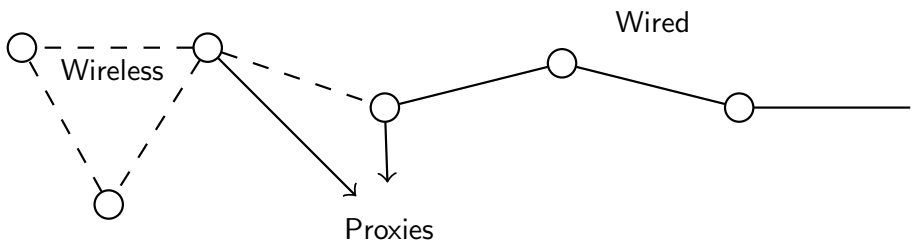

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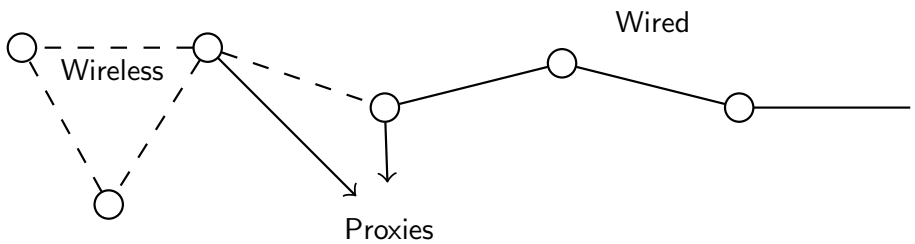

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